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Mechanisms of Management Support and its Effect on Successful IS Implementation: The Case of Ethiopian Customs Authority

Yehenew Sheferaw
Addis Ababa University, yehenew@gmail.com

Solomon Negash
Kennesaw State University, snegash@kennesaw.edu

Donald L. Amoroso
Kennesaw State University, damoroso@kennesaw.edu

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Yehenew Sheferaw
Addis Ababa University, Ethiopia
yehenew@gmail.com

Solomon Negash
Kennesaw State University
snegash@kennesaw.edu

Donald L. Amoroso
Kennesaw State University
damoroso@kennesaw.edu

ABSTRACT

The successful implementation of information systems innovations remains a theoretical as well as a managerial challenge. In particular, the role of management support has been identified as a critical factor. Sharma and Yetton (2003) have stated that the absence of a main effect of management support on implementation success raises important research questions regarding the mechanisms through which management support contribute to implementation success. This work in progress research is a continuation of Sharma and Yetton's recommendation. This study will extend the stream of research model by Sharma and Yetton identifying the role of an important moderator—mechanism of management support—for the successful implementation of IS innovations. The research question for this study is: What is the impact of mechanisms of support on management to successfully implement information systems in an organization? We evaluate this research question in a global context using the successful IS implementation at the Ethiopian Customs Authority.

Keywords
Mechanism of Support, management support, task interdependence, Information System Implementation

INTRODUCTION

A key issue facing managers responsible for the implementation of IS innovations is the development of effective and efficient strategies for successful implementation. Evidence suggests that implementation failure resulting in the write-off of substantial development costs is a common occurrence (Markus and Keil 1994; Sauer1993). Implementation of information systems has been a topic of considerable interest to practitioners as well as academic researchers for over two decades. In a broad sense, implementation refers to all that must be done by a specific organization for it to be able to harness the capabilities of a particular information technology as envisioned.

IS researchers have examined the effect of a wide range of factors on successful implementation. In particular, the role of management support has been identified as a critical factor (Jarvenpaa and Ives 1991; Kwon and Zmud 1987; Leonard-Barton and Deschamps 1988; Purvis et al. 2001). The literature has developed rich theory, hypothesizing a number of mediating and moderating mechanisms, such as management's control over scarce resources, the effect of symbolic actions indicating management commitment, and management decisions affecting key contingencies such as reward systems.

In contrast, the empirical literature, while acknowledging the complexity of the relationship between management support and implementation success, typically hypothesizes a simple main effect (Leonard-Barton and Deschamps 1988; Sanders and Courtney 1985; Yetton et al. 1999). This approach neither reflects the richness of the theory, nor provides a good description or explanation of the relationship. The main-effects model needs to be extended to capture the complexity of the relationship.

Several attempts have been made by IS professionals to bridge this gap. The goal of this paper is to extend this task. This study draws upon recent studies that focus on the role of the institutional context in successful implementation.

The study will extend this stream of research by identifying the role of an important moderator 'mechanism of management support', in shaping the institutional context and, consequently, the successful implementation of IS innovations. This insight will be used to develop a model of implementation success. The model describes how the effect of management support on implementation success is moderated by mechanism of support. A meta-analysis of previous empirical findings provides strong support for the model.

The research question in this study is: What is the impact of mechanisms of management support on the implementation of information systems?

The study will begin by briefly describing current theory, extending it to include the effect of mechanism of support. In order to address the research question Ethiopian Customs Authority is taken into consideration due to the intensive effort that it's exerting in laying the foundation to integrate information systems in its activities.

Background of Ethiopian Customs Authority

The Ethiopian Custom Authority has a responsibility of collecting, compiling and disseminating foreign trade data to different users. Its responsibilities are established by law and it has been offering services for over a century, established in 1889. To accomplish this task Ethiopian Customs has ventured to conduct declaration and data processing in both manual and electronic modes, the manual data processing, however, was not producing timely reports.

Ethiopian customs has 13 collection offices and numerous control stations. It also has several local and one international coordination offices. The international coordination office is in Djibouti, a port city in the horn of Africa, about 600 miles Southeast of Ethiopia's capital, Addis Ababa. Ethiopia being a land locked country relies heavily on the port of Djibouti for its imports and exports. The customs authority processes most of its imports and exports in Addis Ababa. As a result most of the duty and tax activities are conducted in its Addis Ababa offices.

In 2003 the Authority has gone through revision of customs operation process. As a result improved the customs clearance process and put in place a control manual. In this manual the total average time that should be taken for various procedures is indicated provided that all customs requirements (documents and physical conditions) are fulfilled. Currently Automated System for Customs Data (ASYCUDA++) is implemented at the pilot site (Addis Ababa Airport Cargo Section). This site is connected with the central server with wireless communication. Among the modules implemented, Bureau DTI, Remote DTI, Manifest and Selectivity are the main once. Rollout has started to the rest of the collection offices which are found in Addis Ababa (i.e. Addis Ababa Kality Customs, Addis Ababa Airport Passenger Section, and Addis Ababa Post Office).

The implementation success of the automated system is attributed to top management support.Top-level management's priority was for the information system (IS) to support the business activities. The IS architecture, applications integration, or the degree of decentralization of systems development were considered secondary issues by top-level management. In order to realize this, the top-level management communicated to the company's information technology (IT) department to concentrate on business interests. Furthermore, top level management followed the entire process by devising different mechanisms of support.

LITERATURE REVIEW

Research into the implementation of IS innovations considers management support as a critical factor in successful implementation (Jarvenpaa and Ives 1991; Kwon and Zmud 1987; Leonard-Barton and Deschamps 1988; Purvis et al. 2001).The research argues that management support is critical because the implementation of IS innovations is resource intensive. Substantial material and managerial resources are required not only to develop IS applications and infrastructures, but also to support end users during implementation. Such resources are more likely to be forthcoming when the change enjoys management support.

Support and supervision of end users during implementation also contributes to implementation success (Bhattacharjee 1996). Managers need to work closely with end users to mandate, negotiate, persuade, motivate, and support them in adopting IS innovations. Management support is also considered critical for reconceptualizing work processes and for changing existing routines and processes that are critical for successful implementation (Purvis et al. 2001).

Chatterjee et al. (2002), Orlikowski et al. (1995), and Purvis et al. (2001) explore ways in which institutional context and individual actions interact to shape the implementation of IS innovations. Key aspects of the institutional context, such as workflow patterns, work procedures, routines, reward systems, and control and coordination mechanisms both constrain the implementation of technology and are adapted to accommodate new technology (Majchrzak et al. 2000; Orlikowski 1992; Orlikowski et al. 1995).

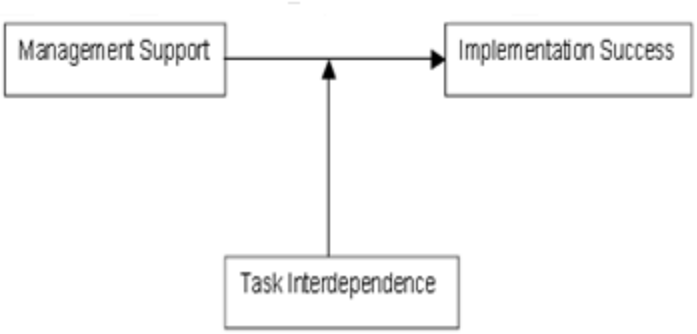

Figure 1. Moderating Effect of Task Interdependence *(adopted from Sharma and Yetton, 2003)*

The moderating effect of task interdependence is shown in Figure 1. Task interdependence also shapes organizational reward systems, another important aspect of the institutional context. Effective task performance is contingent upon a fit between task interdependence and reward systems. A task interdependence-reward systems misfit, such as individual goals and rewards on high interdependence tasks, can lead to goal conflict and diminish the effectiveness of information exchange within groups, leading to lower performance (Andres and Zmud 2002).

Finally, task interdependence has an important role in shaping organizational coordination mechanisms. High interdependence tasks require high levels of information exchange to clarify task assignments, develop effective task performance strategies, make decisions and obtain performance feedback (Andres and Zmud 2002). Coordination mechanisms with high information processing capacity, such as mutual adjustment, are required to coordinate the efforts of individual team members working on such tasks (Galbraith 1973; Groth 1999). In contrast, low interdependence tasks can be coordinated effectively with low information processing mechanisms such as rules and procedures (Galbraith 1973; Mintzberg 1979). Further, the considerable empirical research on Rogers' diffusion theory and the technology acceptance model (TAM) suggests that, within the context of individual-use innovations, motivation to adopt is driven by end users' perceptions of task usefulness (Davis 1989; Davis et al. 1989). Similarly, Bhattacharjee (1996) reports that the inclusion of incentives, behavioral evaluation, and monitoring does not result in increased end-user acceptance over and above that explained by perceived usefulness and ease of use.

RESEARCH FRAMEWORK

Sharma and Yetton (2003) have stated that the absence of a main effect of management support on implementation success raises important research questions regarding the mechanisms through which management support contribute to implementation success. Mechanisms hypothesized to mediate the relationship between management support and implementation success include resource allocation, symbolic support, rewards and sanctions, supervision of end users, and coordination across organizational boundaries (Bhattacharjee 1996; Jarvenpaa and Ives 1991; Klein and Sorra 1996; Leonard-Barton and Deschamps 1988; Sauer 1993). They furthermore recommended that an important question for future research is whether different mechanisms operate under medium and high task interdependence contexts or whether high task interdependence contexts simply require higher levels of all forms of management support (Sharma and Yetton 2003).

The revised model, see Figure 2, is based on the recommendation given above and shows how implementation success is moderated by task interdependence and proposes the addition of one construct—mechanism of support—to clearly show mechanisms through which management support contributes to implementation success.

Management Support

Management support is the variable most frequently hypothesized as contributing to implementation success (Jarvenpaa and Ives 1991; Markus 1981; Purvis et al. 2001). The labels most commonly used for this construct are management support and top management support (Fuerst and Cheney 1982; Guimaraes et al. 1992; Sanders and Courtney 1985; Schultz and Slevin 1975; Yoon et al. 1995).

Task Interdependence

Task interdependence is estimated for each study included in the meta-analysis. Based on the information given in each study, a brief description of the task addressed by the IS innovation was generated. The description includes all information provided in the original study regarding the IS innovation, the task supported by the IS innovation, the organizations

participating in the study, and the end users sampled. All portions of text were taken verbatim from the studies to generate the descriptions. No changes were made to the text except to link extracts that came from different parts of the original study.

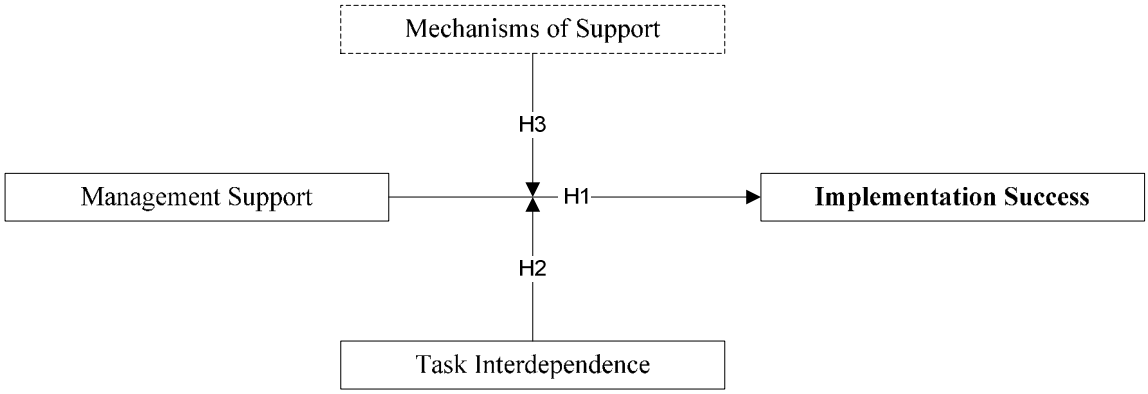

Figure2. Moderating Effect of Mechanism of Support

Mechanism of support

Top-level management expects the information system (IS) to support the business activities. The IS architecture, applications integration, or the degree of decentralization of systems development are secondary issues for top-level management. Top-level management gladly delegates them to the company's information technology (IT) department (IT/Org) to be able to concentrate on business interests.

Nevertheless, top-level management's expectation is not usually fulfilled, and this has a direct impact on the support mechanisms it provides to the successful completion of information systems. Osterele et al (1991) states the reasons for the possible dissatisfaction of top-level management as follows:

- Lack of clarity in the allocation of tasks: Organization managers are dealing with the wrong problems. The technical implementation of the IS (central or decentralized computer architecture) certainly has some implications for business processes, but in practical terms it has nothing to do with the problems to be confronted.
- The distance between business and IT: The corporate strategy and the development of the information system are not adequately coordinated. User involvement, in the form of delegating staff from the organizations to IT projects, does not solve the problem. The organizations do not recognize the business potential of IT, whereas the IT department has too little understanding of the business, and furthermore allows itself to be too easily led by technological rather than business requirements.
- Inadequate planning and implementation: Top-level management's implementation concerns are not limited to purchase requests but also long term objectives including migration and budget plans.

IS should fulfill the functional business requirements efficiently. However, the gap between the IT and organizations in practice gives rise to a situation where the IT department builds up stocks of functionality, and yet cannot offer the functionality that is urgently required, (Osterele et al,1991). Organizations wish to have a flexible IS function that will handle all their future needs. But flexibility costs money, for both development and operation. An IS which is perfectly flexible in all respects cannot exist (Osterele et al, 1991). The enterprise must recognize and develop in advance the structures that it will need in the future.

However success of implementation is not always guaranteed with adequate management support. Through literature review about knowledge management system failure factors Malhotra (2004) cites that: "…Prior discussion has highlighted that knowledge management systems fail because of two broad reasons. First, knowledge management systems are often defined in terms of inputs such as data, information technology, best practices, etc., that by themselves may be inadequate for effective business performance. For these inputs to result in business performance, the influence of intervening and moderating variables such as attention, motivation, commitment, creativity, and innovation, has to be better understood and accounted for in design of business models. Second, the efficacy of inputs and how they are strategically deployed are important issues often left unquestioned as 'expected' performance outcomes are achieved, but the value of such performance outcomes may be eroded by the dynamic shifts in the business and competitive environments…". Ambrosio (2000) cites that

the most common error in implementing knowledge management system is failing to coordinate efforts between information technology and human resources groups. He also says that starting with a low-profile project, not changing the compensation scheme to reward teamwork, building the grand database in the sky to house all your company's knowledge, and assuming someone else will lead the change are the other common errors during knowledge management implementation in the organization that cause failure in knowledge management efforts. Malhotra (2004) also notes that design of knowledge management system should ensure that adaptation and innovation of business performance outcomes occurs in alignment with changing dynamics of the business environment. Simultaneously, conceiving multiple future trajectories of the information technology and human inputs embedded in the knowledge management system can diminish the risk of rapid obsolescence of such systems.

Overall top-level management must participate in its IS development. They must also establish management processes which allow for this participation. IS managers must also ensure that they are raising the right questions to top-management; questions that relate to content and structure of IS. On the other hand technical implementation issues need to be dissociated from these questions and not presented to top-level management.

Top-level management must also make decisions concerning the implementation of IT plans in collaboration with IT department. They must assume responsibility for the costs and benefits of their IS, just as they do for personnel recourses, production units and products. Finally, this participation and responsibility of the organization management needs to be institutionalized. Committees, responsibilities, planning and control mechanisms and documents need to be agreed upon.

The literature identifies five indicators for mechanism of support including resource allocation, symbolic support, rewards and sanctions, supervision of end users, and coordination across organizational boundaries.

HYPOTHESIS

The model in Figure 2 shows how successful implementation is a joint outcome of metastructuration actions and task interdependence. As the level of task interdependence increases, the institutional context presents increased barriers to successful IS implementation. These barriers have to be overcome by effective metastructuration actions requiring high levels of management support (Eveland and Tornatzky 1990; Fleischer and Roitman 1990; Purvis et al. 2001).

Extending the dominant main-effects model, the effectiveness of management support is hypothesized to be context dependent: the influence of management support on successful IS implementation increases as the mechanism of support improves. Formally,

H1: The effect of management support on implementation success is a positive function of mechanism of support.

Fichman (1992) reports that implementation is the result of autonomous individual adoption decisions. Moreover, Yetton et al. (1999) observe that organizational barriers to adoption are weak and, therefore, that management support is not a critical factor. Ginzberg (1981) and Guimaraes et al. (1992) report similar results.

Considered together, the above findings suggest that, in low task interdependence contexts, structuration actions undertaken by end users to appropriate technologies are adequate for successful adoption. Metastructuration activities, in particular those requiring management sanction and support, do not have a systematic effect on successful implementation. Consequently, in low task interdependence contexts, the correlation between mechanism of support and implementation success is expected to be low. Formally,

H2: In low task interdependence contexts, the effect of mechanism of support on implementation success is weak.

The absence of a main effect of management support on implementation success raises important research questions regarding the mechanisms through which management support contributes to implementation success. Mechanisms hypothesized to mediate the relationship between management support and implementation success include resource allocation, symbolic support, rewards and sanctions, supervision of end users, and coordination across organizational boundaries (Bhattacharjee 1996; Jarvenpaa and Ives 1991; Klein and Sorra 1996; Leonard-Barton and Deschamps 1988; Sauer 1993). Consequently, in low task interdependence contexts, the correlation between mechanism of support and implementation success is expected to be low. Formally,

H3: In weak mechanism of support the implementation success of an IS system is weak.

METHODS

The research purpose and objectives determine the type of research design employed for a study (Katundu, 1998). Given the nature of the research problem and purpose of the present study, the most appropriate research methodology is survey. According to Busha and Harter (1980), survey research is capable of collecting background information and hard-to-find data

and the researcher would not have the opportunity to motivate or influence respondents' responses. Sproull (1995) recommends the survey technique for research where attitudes, ideas, comments and public opinion on a problem or issue are studied. The descriptive survey approach is chosen for the present study, because it seeks to gain insight into a phenomenon as a means of providing basic information in an area of study (Bless and Higson-Smith, 1995).

Data collection method and technique

A self-administered questionnaire will be the main method used to collect data in the present study. Other methods to be used for the study include primary sources (documentation, online data), interviews, focus group discussions and observations.

The self-administered questionnaire

A self-administered questionnaire will be used, see sample in the Appendix A. Questionnaires are one of the best impersonal observation techniques used for eliciting data (Leedy, 1993). Respondents are more likely to respond honestly because of anonymity.

The questionnaire will be supplemented by face-to-face interviews. This procedure gives clarity on issues, reducing the ambiguity that goes with questionnaires. Researcher agrees with Katundu (1998), who said that the use of more than one data gathering instrument – the triangulation method – is considered vital in an under-researched problem such as that in the present study.

Format of questionnaire

The questionnaire to be used for this study will be semi-structured, consisting of a mixture of closed and open-ended questions. De Vaus (1991) provides a number of advantages of closed or forced-choice questions. This is in spite of the problems associated with closed questions, such as providing an adequate range of alternatives to respondents. De Vaus (1991) states that closed question questionnaires are easier to code and recommends exhaustive alternative responses as a remedy to the problems. Open-ended questions will be included in the questionnaires in the present study to determine the general feelings of teachers and students on issues and the reasons for their opinions.

Pre-test for validity and reliability

The questionnaire will be pre-tested to test the instruments for validity and reliability (Nevell, 1993) and to determine how realistic the questions are to the ability of management staff. Nevell (1993) stressed the importance of scrutinizing data-gathering instruments to identify ambiguity or misleading questions and for instructions and suggesting improvements.

Research population

Leedy (1993) observed that nothing comes out at the end of a long and involved study that is any better than the care, precision, consideration and the thought that goes into the basic planning of the research and the careful selection of the population. The research population of this study is defined as low-level, mid-level and top-level managers in the Ethiopian Customs Authority in Ethiopia. The appropriate care, precession, and consideration will be taken in this study.

Indicators/ Measures

Mechanisms hypothesized to mediate the relationship between management support and implementation success include resource allocation, symbolic support, rewards and sanctions, supervision of end users, and coordination across organizational boundaries (Bhattacharjee, 1996; Jarvenpaa and Ives, 1991; Klein and Sorra, 1996; Leonard-Barton and Deschamps, 1988; Sauer, 1993). If the goal is to improve adaptive functioning and reduce antisocial behavior on the part of offenders, then it is essential to closely monitor their behavior and impose certain and immediate sanctions for infractions and rewards for achievements.Failing to punish misconduct inevitably makes behavior worse, and failing to reward accomplishments makes those accomplishments less likely to recur. According to Churchman (1971), management is responsible for allocating resources in order to achieve an organization's purpose. "In organizations, the decision-making function is the responsibility of management. In order to execute its responsibility, an organization's management requires information about the resources available to it and their relative effectiveness for achieving the organization's purpose. Resources are acquired, allocated, motivated and manipulated under the manager's control. They include people, materials, plant and equipment, money, and information.'' (Churchman, 1971)

Management support is the variable most frequently hypothesized as contributing to implementation success (Jarvenpaa and Ives 1991; Markus 1981; Purvis et al. 2001). And as revised by Sharma and Yetton (2003), it will be measured through attributes believed to reflect the variable namely: beliefs and participation (Chattergee and Grewal 2002).

Organizational routines are underpinned by stable patterns of interdependencies that involve exchanges of materials and information that are essential to perform organizational tasks. Thompson (1967) identifies three different forms of task interdependence: pooled, sequential, and reciprocal. Pooled interdependence involves only limited exchange of materials, resources, and information. It is characterized by low levels of task interdependence. In contrast, sequential and reciprocal forms involve significant exchanges. They are characterized by high levels of task interdependence (Pearce et al. 1992; Thompson 1967). For example, the use of IS innovations such as word processing, spreadsheets and other personal productivity applications is characterized by low levels of task interdependence. In contrast, the use of IS innovations such as enterprise resource planning (ERP) systems is characterized by high levels of task interdependence.

Data presentation and analysis

Inferential statistics will be adopted for presenting and analyzing the data in this study Inferential statistics are used to draw inferences about a population from a sample. There are two main methods used in inferential statistics: estimation and hypothesis testing. In estimation, the sample is used to estimate a parameter and a confidence interval about the estimate is constructed. With inferential statistics, one is trying to reach conclusions that extend beyond the immediate data alone. For instance, inferential statistics is used to try to infer from the sample data what the population might think. Thus, we use inferential statistics to make inferences from our data to more general conditions; we use descriptive statistics simply to describe what's going on in our data.

Most of the major inferential statistics come from a general family of statistical models known as the General Linear Model. This includes the t-test, Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), regression analysis, and many of the multivariate methods like factor analysis, multidimensional scaling, cluster analysis, discriminant function analysis, and so on. However, descriptive statistics by the use of frequency tables, percentages and charts will be used, where necessary, to give the reader a better understanding of the data.

CONCLUSION

A key issue facing managers responsible for the implementation of IS innovations is the development of effective and efficient strategies for successful implementation. Evidence suggests that implementation failure resulting in the write-off of substantial development costs is a common occurrence (Markus and Keil 1994; Sauer 1993). The findings of this study will be a step toward providing a basis for selecting an efficient and effective portfolio of such interventions to fit the needs of the situation.

A key implication of this research will be to find out the magnitude and effect of mechanism of support on management support and task interdependence for successful IS implementation. In low task interdependence contexts, the effect of management support on implementation success is low. Consequently, investing in high levels of management support to obtain high levels of end-user adoption is not likely to be effective. It will also be inefficient as scarce and valuable managerial effort and attention would be wasted. In this context, different theoretical frameworks, such as diffusion theory (Rogers 1983) and the technology acceptance model (Davis 1989) may suggest appropriate strategies. Conversely, in high task interdependence contexts, management support has a significant impact on implementation success. Consequently, investing in various forms of management support results in increased end-user adoption.

The absence of a main effect of management support on implementation success raises important research questions regarding the mechanisms through which management support contributes to implementation success. Mechanisms hypothesized to mediate the relationship between management support and implementation success include resource allocation, symbolic support, rewards and sanctions, supervision of end users, and coordination across organizational boundaries (Bhattacharjee 1996; Jarvenpaa and Ives 1991; Klein and Sorra 1996; Leonard-Barton and Deschamps 1988; Sauer 1993).

Implementation strategies that do not invest in changes to the institutional context are likely to be both ineffective and inefficient. In addition, metastructuration actions that do not create a fit between task interdependence and performance control systems are also likely to be ineffective. For instance, the appropriate metastructuration response to IS innovations that increase levels of task interdependence should be to increase reliance on both group-based rewards and coordination mechanisms with high information processing capacity. Conversely, the appropriate metastructuration response to IS innovations that decrease levels of task interdependence should be to increase reliance on both individual based rewards and coordination mechanisms with low information processing capacity.

This work in progress study will try to show how mechanisms mediate the relationship between management support and implementation success including issues like resource allocation, symbolic support, rewards and sanctions, supervision of end users, and coordination across organizational boundaries.

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APPENDIX A

Survey Instrument Specification

In general, the survey instrument specification will serve as a guide for the researcher to follow during the development of the survey instrument that will be used in this study.

Purpose of the Survey Instrument

A survey instrument will be developed for this study using this survey instrument specification. The survey instrument will allow the researcher to collect all necessary data for fulfilling the purpose of the study. Specifically, the survey instrument will be developed to address the research questions of this study.

Task Interdependence Survey Instrument Table Used by Sharma and Yetton (2003) Reproduced from Pearce et al. (1992).

1. This task can be performed fairly independently of others. (Reverse coded)
2. This task can be planned with little need to coordinate with others. (Reverse coded)
3. It is rarely required to obtain information from others to complete this task. (Reverse coded)
4. This task is relatively unaffected by the performance of other individuals or departments.(Reverse coded)
5. This task requires frequent coordination with the effort of others.
6. Performance on this task is dependent on receiving accurate information from others.

All items were rated on a 1-5 Disagree-Agree scale.

Survey instrument for management support

1. Overall, my servicing HR office met my needs
2. Overall training services provided by my servicing HR office met my needs
3. The Benefits Counseling and Administration provided by my servicing HR office met my needs
4. The Employee Relations Advice and/or Assistance provided by my servicing HR office met my needs:
5. Management Support Survey Instrument Table is developed and used by the United States department of commerce.

All items were rated on a 1-5 Favorable - unfavorable scale.

Mechanism of Support Survey Instrument will consist of the following elements

1. A semi-structured interview protocol for the inventory of mechanisms of support of managers. Questions concern:

    - Awareness of management support and improvement of problem
    - Activities undertaken on mechanisms of management support
    - Intentions concerning mechanisms of support
    - Experienced and perceived obstacles

2. A pre-structured questionnaire for use with samples of individual primary care providers about:

    - Awareness of management support actions undertaken
    - Management support activities at practical level
    - Priorities and needs concerning mechanisms of support
    - Perceived possibilities for change

3. A pre-structured questionnaire for use with samples of managers with a comparable structure as the providers questionnaire.